**Zał. nr 2 do ZW 64/2012**

**Attachment no. …. to Programme of Education**

# PROGRAMME OF STUDIES

## 1. Description

| | |
|---|---|
| *Number of semesters:* | *Number ECTS points necessary to obtain qualifications: 210* |
| *Prerequisites (particularly for second-level studies):*<br>*The competition of grades from maturity certificate and certificate of secondary school.*<br>*In case of foreign students, secondary school certificate, received after the completion of a recognized secondary school (total 12 years of education), being the equivalent of Polish maturity certificate accepted by Kuratorium Oświaty.* | *Upon completion of studies graduate obtains*<br>*professional degree of: engineer (inż)*<br>*1st/~~2nd~~* level qualifications* |
| *Possibility of continuing studies:*<br>*the possibility to continue study at the second level* | *Graduate profile, employability:*<br>*First level studies (undergraduate - engineer degree ) are not divided into specializations. It gives students opportunity to get basic knowledge in the area of informatics including programming, algorithms and data structures, programming languages and techniques, computer architecture, computer networks, databases and data warehouses, embedded systems including mobile systems, distributed and web-based systems, multimedia, intelligent systems and IT project management - needed for design, development and exploitation of modern IT solutions among others for the Internet and e-economy. Studies shows a variety of computer applications in* |

| | |
|---|---|
| | *technical, economic and biomedical systems. They learn methods of data collection and processing, basic of decision-making, methods of artificial intelligence and expert systems. IT knowledge is complemented by knowledge of physics and mathematics, management science and social communication. The graduate has the ability to efficiently use modern tools of information technology and has wide social skills such as ability to cooperate and work in a team, understands the needs and knows the capabilities of continuous education, understands the ethical, economic and law conditions of computer engineer activity. He knows English language at the B2 level. In the case of foreign students studying in English language, they know Polish language at a basic level.*<br><br>*Obtained knowledge and abilities gives opportunity to continue education at the second level by choosing one of 12 specialisation offered by Faculty of Computer Science and Management: security of information systems, informatics technologies of knowledge management, intelligent information systems, Internet and mobile technologies, software engineering, information systems, database systems, decision support systems, teleinformatics, intelligent information systems, computer engineering, information technologies. It is a general Faculty offer. In each admission process different specializations may be open, which one will be open depends on students preference. Moreover some of the specializations and the first level of study in each academic year* |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | |
|---|---|
| | *are given in English also.*<br><br>*Gained during first level of study skills can be grouped into five groups of skills:*<br><br>*• use modern information technology tools and systems*<br>*• design and create software solutions in IT and non-IT systems for various applications and made in different technologies*<br>*• implementation and deploying efficient, reliable, safe and satisfying user requirements IT solutions*<br>*• evaluation, improvement, proposing and developing solutions that include computer system,*<br>*• management, administration, installation, deploying, and testing of IT tools and systems*<br><br>*A graduate can be employed in companies that produce software or in companies, which designs, deploys and administers computer networks or computer systems for different applications in economic or social sectors of public and private organizations:*<br>*• Application / system programmer*<br>*• Network administrator*<br>*• Linux / Windows systems administrator* |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | |
|---|---|
| | *• Computer engineer / IT specialist / serviceman / tester*<br>*• Webdesigner/Webdeveloper/Webmaster*<br><br>*A graduate can works as an employee or manager as well as can be IT company owner.* |
| *Indicate connection with University's mission and its development strategy:* | *Informatics field of study is carried out at the Faculty of Computer Science and Management, which is one of the largest of 12 faculties of Wrocław University of Technology. Teaching program at Informatics field of study at the first level of study represents differentiated substantially canon of knowledge, skills and competencies necessary for modern informatics engineer. It is consistent with the mission of the University and its development strategy, which requires from graduates certain the skills with an emphasis on social skills and competences to allow actively formulate and build the private future and prosperity as well as at the University, and the region. Offered curriculum meets the requirements of the National Education Framework and builds graduate skills, based on current and future information technology methods and tools, which vary significantly in education cycle. Substantive differentiation of program is justified by dynamically changing market needs, and by academics having the highest qualifications in the discipline of informatics. Development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, for example: ERASMUS, COST, etc. Academics and* |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | |
|---|---|
| | *students take part in these programs carrying out research as well as diploma theses. Teaching at a high level based on the modern and constantly modernized laboratories in which students can develop their practical skills. The Institute has the necessary computing equipment, laboratories and software for the first level students, moreover ZPI and diploma students have access to integrated virtualized computing platform. According to the mission of the University for needs in terms of relations with region and its economy, the Institute has strong relations with local as well foreign IT companies. Cooperation with companies includes the following forms: ordering projects by IT companies, ordering projects by IT companies, ordering reviews for innovation, special lectures for students conducted by experts from companies, realization by students diploma thesis on topics in which company is interested in, realization during Team Project course projects in which company is interested in, practical training for students, sponsoring of student competitions organized by the Institute of Informatics, joint seminars of business professionals and employees of the Faculty of Computer Science and Management organized by the IT Companies Forum, hardware and software support by IT companies for academic initiatives. The most important companies which cooperates with the Institute of Informatics are as follows: Capgemini, IBM, Microsoft Corp., Nokia Siemens Networks, Volvo, InsERT. The Institute of Informatics is one of the first academic institution, which have a laboratory for students with specialized* |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | |
|---|---|
| | *professional training, organized by the IBM Academic Initiative, Microsoft IT Academy, Cisco Academy, Advanced Digital Broadcasting. What's more these activities are included into teaching process.* |

**2. Fields of science and scientific disciplines to which educational effects apply:**

Informatics direction is general academic profile that belongs to education area of technical sciences

**3. Concise analysis of consistency between assumed educational effects and labour market needs**

Correspond to the needs of:

a) institutions and companies engaged in an activity of manufacturing, trade, services and research for IT professionals involved in the maintenance / development of IT tools to support this activity at the operational and strategic (planning, management) levels,
b) manufacturers of IT systems for various purposes (designers, programmers, testers, administrators),
c) companies designing, deploying and maintaining computer systems and networks in different departments of enterprises and social organizations, both public and private.

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

# 4. List of education modules:

## 4.1. List of obligatory modules:

### 4.1.1 List of general education modules

#### 4.1.1.1 *Liberal-managerial subjects* module *(min 2 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | ZMZ1496W | Introduction to Management Science | 2 | | | | | K1INF_W18 | 30 | 60 | 2 | 1,2 | T | Z | | | KO | Ob |
| | | Total | 2 | | | | | | 30 | 60 | 2 | 1,2 | | | | | | |

#### 4.1.1.2 *Foreign languages* module *(min. ..... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

#### 4.1.1.3 *Sporting classes* module *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | | | | | | | | | | | | | | | |

### 4.1.1.4 *Information technologies* module *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0250Wl | Introduction to Programming **(GK)** | 2 | | 2 | | | K1INF_W04, K1INF_U01, K1INF_U14 | 60 | 210 | 7 | 4,2 | T | Z | | (3) | KO | Ob. |
| 2 | INZ0251Wc | Introduction to Computer Systems **(GK)** | 2 | 1 | | | | K1INF_W08 | 45 | 150 | 5 | 3,0 | T | Z | | | KO | Ob |
| | | Total | 4 | 1 | 2 | 0 | 0 | | 105 | 360 | 12 | 7,2 | | | | | | |

## Altogether for general education modules

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| 6 | 1 | 2 | 0 | 0 | 135 | 420 | 14 | 8,4 |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

## 4.1.2 List of basic sciences modules

### 4.1.2.1 *Mathematics* module

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | MAP1070C | Elementary Linear Algebra | | 2 | | | | K1INF_W01 | 30 | 60 | 2 | 1,2 | T | Z | O | | PD | Ob. |
| 2 | MAP1070W | Elementary Linear Algebra | 2 | | | | | K1INF_W01 | 30 | 90 | 3 | 1,8 | T | E | O | | PD | Ob. |
| 3 | MAP1043C | Mathematical Analysis I | | 2 | | | | K1INF_W01 | 30 | 60 | 2 | 1,2 | T | Z | O | | PD | Ob. |
| 4 | MAP1043W | Mathematical Analysis I | 2 | | | | | K1INF_W01 | 30 | 120 | 4 | 2.4 | T | E | O | | PD | Ob |
| 5 | MAP2005C | Mathematical Analysis II | | 2 | | | | K1INF_W01 | 30 | 90 | 2 | 1,2 | T | Z | O | | PD | Ob |
| 6 | MAP2005W | Mathematical Analysis II | 2 | | | | | K1INF_W01 | 30 | 120 | 4 | 2,4 | T | E | O | | PD | Ob |
| 7 | INZ0257C | Theory of Probabilistic and Statistics | | 2 | | | | K1INF_W02 | 30 | 60 | 2 | 1,2 | T | Z | | | PD | Ob. |
| 8 | INZ0257W | Theory of Probabilistic and Statistics | 2 | | | | | K1INF_W02 | 30 | 90 | 4 | 2,4 | T | E | | | PD | Ob. |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | 8 | 8 | | | | | 240 | 690 | 23 | 13,8 | | | | | | |

### 4.1.2.2 *Physics* module

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | FZP1052C | General Physics | | 1 | | | | K1INF_W03 | 15 | 60 | 2 | 1,2 | T | Z | O | | PD | Ob. |
| 2 | FZP1052W | General Physics | 2 | | | | | K1INF_W03 | 30 | 90 | 3 | 1,8 | T | E | O | | PD | Ob. |
| 3 | FZP2079L | General Physics | | | 1 | | | K1INF_W03, K1INF_U07, K1INF_U14 | 15 | 60 | 2 | 1,2 | T | Z | O | P | PD | Ob |
| | | Total | 2 | 1 | 1 | | | | 60 | 210 | 7 | 4,2 | | | | | | |

### 4.1.2.3 *Chemistry* module

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

### 4.1.2.4 *Electronics and metrology module*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0252Wc | Electronics and Metrology – basic principles **(GK)** | 2 | 1 | | | | K1INF_W07, K1INF_W08, K1INF_U14 | 45 | 150 | 5 | 3,0 | T | Z | | | PD | Ob |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | INZ0256L | Electronics and Metrology – basic principles | | | 2 | | | K1INF_W07, K1INF_U14 | 30 | 60 | 2 | 1,2 | T | Z | | P | PD | Ob. |
| | | Total | 2 | 1 | 2 | | | | 75 | 210 | 7 | 4,2 | | | | | | |

**Altogether for basic sciences modules:**

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| 12 | 10 | 3 | 0 | 0 | 375 | 1110 | 37 | 22,2 |

## 4.1.3 List of main-field-of-study modules

### 4.1.3.1 *Obligatory main-field-of-study* modules

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0253Wl | Computer Architecture and Organization **(GK)** | 2 | | 2 | | | K1INF_W08, K1INF_U06, K1INF_U14 | 60 | 150 | 6 | 3,6 | T | E | | (3) | K | Ob |
| 2 | INZ0254Wcl | Data Structures and Algorithms***(GK)*** | 2 | 1 | 2 | | | K1INF_W04, K!INF_U01, K1INF_U14 | 75 | 180 | 6 | 3,6 | T | E | | (3) | K | Ob |
| 3 | INZ0255C | Theory of Information and Signals | | 2 | | | | K1INF_W11, K1INF_U07 | 30 | 60 | 2 | 1,2 | T | Z | | | K | Ob |
| 4 | INZ0255W | Theory of Information and Signals | 2 | | | | | K1INF_W11 | 30 | 120 | 4 | 2,4 | T | E | | | K | Ob. |
| 5 | INZ0258C | Logics and Discrete Mathematics | | 2 | | | | K1INF_W02, K1INF_W17 | 30 | 90 | 3 | 1,8 | T | Z | | | K | Ob |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | INZ0258W | Logics and Discrete Mathematics | 2 | | | | | K1INF_W02, K1INF_W17 | 30 | 90 | 3 | 1,8 | T | E | | | K | Ob |
| 7 | INZ0259Wcl | Databases **(GK)** | 2 | 1 | 1 | | | K1INF_W07, K1INF_W16 K1INF_W22, K1INF_U19, K1INF_U04, K1INF_U09, K1INF_U14 | 60 | 150 | 5 | 3,0 | T | E | | (2) | K | Ob |
| 8 | INZ00260Wl | Object-Oriented Programming **(GK)** | 2 | | 2 | | | K1INF_U02, K1INF_U14 K1INF_W05, K1INF_W06 | 60 | 150 | 4 | 2,4 | T | Z | | (2) | K | Ob. |
| 9 | INZ0297W | Systems analysis and decision support methods in Computer | 2 | | | | | K1INF_W15 | 30 | 90 | 3 | 1,8 | T | E | | | K | Ob |
| 10 | INZ0297C | Systems analysis and decision support methods in Computer | | 1 | | | | K1INF_U15 K1INF_U14 | 15 | 30 | 1 | 0,6 | T | Z | | | K | Ob |
| 11 | INZ0297L | Systems analysis and decision support methods in Computer | | | 1 | | | K1INF_W15 | 15 | 60 | 1 | 0,6 | T | Z | | P | K | Ob |
| 12 | INZ0262W | Computer Networks and Communications | 2 | | | | | K1INF_W11 | 30 | 30 | 3 | 1,8 | T | E | | | K | Ob |
| 13 | INZ0262l | Computer Networks and Communications | | | 2 | | | K1INF_U08, K1INF_U07, K1INF_U09, K1INF_U14 | 30 | 60 | 2 | 1,2 | T | Z | | P | K | Ob |
| 14 | INZ0263Wcl | Introduction to Software Engineering **(GK)** | 2 | 1 | 1 | | | K1INF_U03, K1INF_U14, K1INF_W07 | 60 | 150 | 5 | 3,0 | T | E | | (2) | K | Ob |
| 15 | INZ0264Wl | Operating Systems **(GK)** | 2 | | 2 | | | K1INF_W10 K1INF_U03 | 60 | 150 | 5 | 3,0 | T | Z | | (2) | K | Ob |
| 16 | INZ0265Wl | Multimedia Embedded Systems **(GK)** | 2 | | 2 | | | K1INF_U04, K1INF_U06, K1INF_W09, | 60 | 150 | 5 | 3,0 | T | Z | | (2) | K | Ob |
| 17 | ZMZ1496W | Introduction to Management Science | 2 | | | | | K1INF_W18 | 30 | 60 | 2 | 1,2 | T | Z | | | KO | Ob |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | INZ0268Wl | Data Warehouses **(GK)** | 2 | | 2 | | | K1INF_U03, K1INF_U04, K1INF_U16, K1INF_U14 K1INF_W07K1INF_W15 | 60 | 150 | 5 | 3,0 | T | Z | | (2) | K | Ob |
| 19 | INZ0298W | Computer Control Systems | 1 | | | | | K1INF_W15, K1INF_W21 | 150 | 30 | 2 | 1,2 | T | E | | | K | Ob |
| 21 | INZ0298L | Computer Control Systems | | | 2 | | | K1INF_W07, K1INF_U15, K1INF_U18, K1INF_U14 | 30 | 90 | 2 | 1,2 | T | Z | | P | K | Ob |
| 22 | INZ0298P | Computer Control Systems | | | | 1 | | K1INF_W07, K1INF_U15, K1INF_U18, K1INF_K02 | 15 | 60 | 1 | 0,6 | T | Z | | P | K | Ob |
| 23 | INZ0270Wp | Software System Development **(GK)** | 2 | | | 2 | | K1INF_U02, K1INF_U03, K1INF_U04, K1INF_U13, K1INF_U14,K1INF_W05, K1INF_W07 | 60 | 150 | 5 | 3,0 | T | E | | (2) | K | Ob. |
| 24 | INZ0277Wcl | Introduction to Parallel and Distributed Systems **(GK)** | 2 | 1 | 1 | | | K1INF_U04, K1INF_U14 K1INF_W12 | 60 | 150 | 5 | 3,0 | T | E | | (2) | K | Ob |
| 25 | INZ0278Wcl | Computer Security **(GK)** | 2 | 1 | 1 | | | K1INF_U03, K1INF_U09, K1INF_U14, K1INF_W13 | 60 | 120 | 4 | 2,4 | T | E | | (2) | K | Ob |
| 27 | INZ0279Wl | Introduction to Artificial Intelligence **(GK)** | 2 | | 2 | | | K1INF_U07, K1INF_U16, K1INF_U14, K1INF_W15 | 60 | 120 | 4 | 2,4 | T | E | | (2) | K | Ob |
| 28 | INZ0284Wl | Internet Technologies **(GK)** | 2 | | 2 | | | K1INF_U06, K1INF_U07, K1INF_U14, K1INF_U05, K1INF_W14 | 60 | 120 | 4 | 2,4 | T | Z | | (2) | K | Ob |
| | | Total | 37 | 10 | 25 | 3 | 0 | | 1125 | 2760 | 92 | 55,2 | | | | | | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

**Altogether (for main-field-of-study modules):**

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| 37 | 10 | 25 | 3 | 0 | 1125 | 2760 | 92 | 55,2 |

# 4.2 List of optional modules

## 4.2.1 List of general education modules

### 4.2.1.1 Liberal-managerial subjects modules *(min. 4 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0295s | Computer Ethics | | | | | 2 | K1INF_W20, K1INF_K03, K1INF_K05 | 30 | 60 | 2 | 1,2 | T | Z | | | K | W |
| 2 | INZ0287W | Social and Law Aspects of Computer Science | 2 | | | | | K1INF_W20, K1INF_W19, K1INF_K03, K1INF_K05 | 30 | 60 | 2 | 1,2 | T | Z | | | K | W |
| 3 | INZ0288Ws | Copyright and Related Computer Law **(GK)** | 1 | | | | 1 | K1INF_W20, K1INF_W19, K1INF_K03, K1INF_K05 | 30 | 60 | 2 | 1,2 | T | Z | | | K | W |
| 4 | INZ0287W | Social and Law Aspects of Computer Science | 2 | | | | | K1INF_W20, K1INF_W19, K1INF_K03, K1INF_K05 | 30 | 60 | 2 | 1,2 | T | Z | | | K | W |
| | | Total | 3 | | | | 1 | | 60 | 120 | 4 | | | | | | | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

### 4.2.1.2 *Foreign languages* **module** *(min5 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | JZL100400BK | Foreign language | | 4 | | | | K1INF_U17 | 60 | 60 | 2 | 1,2 | T | Z | O | | KO | W |
| 2 | JZL100400BK | Foreign language | | 4 | | | | K1INF_U17 | 60 | 90 | 3 | 1,8 | T | E | O | | KO | W |
| | | Total | | 8 | | | | | 120 | 150 | 5 | 3 | | | | | | |

### 4.2.1.3 **Sporting classes module** *(min1 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | WFW000000BK | Sports | | 2 | | | | K1INF_K08 | 30 | 30 | 1 | 0,6 | T | Z | O | | KO | W |
| | | Total | | 2 | | | | | 30 | 30 | 1 | | | | | | | |

### 4.2.1.4 *Information technologies* **module** *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

**Altogether for general education modules:**

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| 3 | 10 | 0 | 0 | 1 | 210 | 300 | 10 | 6 |

## 4.2.2 List of basic sciences modules

### 4.2.2.1 *Mathematics* module *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

### 4.2.2.2 *Physics* module *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

### 4.2.2.3 *Chemistry* module *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | symbol | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

**Altogether for basic sciences modules:**

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| | | | | | | | | |

## 4.2.3 List of main-field-of-study modules

### 4.2.3.1 Database Programming - Module M_1 *(min 5 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0266Wp | Database Design **(GK)** | 2 | | | 2 | | K1INF_W07, K1INF_W16, K1INF_W22, K1INF_U03, K1INF_U04, K1INF_U09, K1INF_U16, K1INF_U19 | 60 | 150 | 5 | 3,0 | T | Z | | (3) | K | W |
| 2 | INZ0267Wl | Client-Server Architecture **(GK)** | 2 | | | 2 | | K1INF_W07, K1INF_W16, K1INF_W22, K1INF_U03, K1INF_U04, K1INF_U09, K1INF_U16, K1INF_U19 | 60 | 150 | 5 | 3,0 | T | Z | | (3) | K | W |
| | | Razem | 2 | 0 | 0 | 2 | 0 | | 60 | 150 | 5 | 3,0 | | | | | | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

### 4.2.3.2 Multimedia - Module M_2 *(min. 5 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0271Wl | Introduction to Computer Graphics **(GK)** | 2 | | 2 | | | K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W23 | 60 | 150 | 5 | 3,0 | T | Z | | (3) | K | W |
| 2 | INZ0272Wl | Multimedia Information Systems **(GK)** | 2 | | 2 | | | K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W23 | 60 | 150 | 5 | 3,0 | T | Z | | (3) | K | W |
| | | Razem | 2 | 0 | 2 | 0 | 0 | | 60 | 150 | 5 | 3,0 | | | | | | |

### 4.2.3.3 Web application programming - Module M_3 *(min.4 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0273Wl | Java and Internet programming **(GK)** | 1 | | 2 | | | K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W05, K1INF_W06, K1INF_W07 | 45 | 120 | 4 | 2,4 | T | Z | | (2) | K | W |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | INZ0274Wl | Programming of Web-based systems **(GK)** | 1 | | 2 | | | K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W05, K1INF_W06, K1INF_W07 | 45 | 120 | 4 | 2,4 | T | Z | | (2) | K | W |
| | | Total | 1 | 0 | 2 | 0 | 0 | | 45 | 120 | 4 | 2,4 | | | | | | |

### 4.2.3.4 Software Project Management - Module M_4 *(min. 4. ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0275Wl | Software Project Management **(GK)** | 2 | | 1 | | | K1INF_U10, K1INF_K02, K1INF_U14, K1INF_W18 | 45 | 120 | 4 | 2,4 | T | Z | | (2) | K | W |
| 2 | INZ0276Wls | Software Project Management Techniques **(GK)** | 1 | | 1 | | 1 | K1INF_U10, K1INF_K02, K1INF_U14, K1INF_W18 | 45 | 120 | 4 | 2,4 | T | Z | | (2) | K | W |
| | | Total | 1 | 0 | 1 | 0 | 1 | | 45 | 120 | 4 | 2,4 | | | | | | |

### 4.2.3.5 Network and computer systems - Module M_5 module *(min. 5 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0282Wl | Security in Computer Network **(GK)** | 2 | | 2 | | | K1INF_U03, K1INF_U09, K1INF_U14, K1INF_W13 | 60 | 150 | 5 | 3,0 | T | Z | | (3) | K | W |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | INZ0283Wl | System Administration **(GK)** | 2 | | 2 | | | K1INF_W10, K1INF_W11, K1INF_U08,, K1INF_U09, K1INF_U14 | 60 | 150 | 5 | 3,0 | T | Z | | (3) | K | W |
| | | Total | 2 | 0 | 2 | 0 | 0 | | 60 | 150 | 5 | 3,0 | | | | | | |

### 4.2.3.6 Technologies and programming tools - Module M_6 *(min.5 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0289Wcl | Programming Languages and Paradigms **(GK)** | 2 | 1 | 1 | | | K1INF_W05, K1INF_W06 K1INF_U02, K1INF_U14 | 60 | 150 | 5 | 3,0 | | Z | | (2) | K | W |
| 2 | INZ0290Wl | User Interface Development **(GK)** | 2 | | 2 | | | K1INF_U06, K1INF_U07, K1INF_U13, K1INF_W04 | 60 | 150 | 5 | 3,0 | T | Z | | (2) | K | W |
| 3 | INZ0291Wcl | Program Translation Techniques **(GK)** | 2 | 1 | 1 | | | K1INF_U01, K1INF_W06 | 60 | 150 | 5 | 3,0 | T | Z | | (2) | K | W |
| 4 | INZ0292Wc | Numerical Methods **(GK)** | 2 | 2 | | | | K1INF_U01, K1INF_W04 | 60 | 150 | 5 | 3,0 | T | Z | | | K | W |
| | | Total | 2 | 1 | 1 | | 0 | | 60 | 150 | 5 | 3,0 | | | | | | |

### 4.2.3.7 Development trends in computer science - Module M_7 module *(min.5 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0293Wl | E-Business Concept and Technologies **(GK)** | 2 | | 2 | | | K1INF_U11, K1INF_W14, K1INF_W12, K1INF_K01, | 60 | 150 | 5 | 3,0 | T | Z | | (2) | K | W |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | K1INF_K06 | | | | | | | | | | | |
| 2 | INZ0294Wc | Theory of Computation **(GK)** | 2 | 2 | | | | K1INF_K01, K1INF_W02 | 60 | 150 | 5 | 3,0 | T | Z | | | K | W |
| | | Total | 2 | 1 | 1 | 0 | 0 | | 60 | 150 | 5 | 3,0 | | | | | | |

### 4.2.3.8 Elective subjects module *(min.26 ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| 1 | INZ0280P | Preparatory Project | | | | 2 | | K1INF_K01, K1INF_K02, K1INF_K03, K1INF_K04, K1INF_K05, K1INF_U11, K1INF_U12, K1INF_U13 | 30 | 60 | 2 | 1,2 | T | Z | | P | K | W |
| 2 | INZ0281P | Team Project | | | | 4 | | K1INF_U02, K1INF_U05, K1INF_U06, K1INF_U10, K1INF_U12, K1INF_U13, K1INF_K01, K1INF_K03, K1INF_K04, K1INF_K05 | 60 | 150 | 5 | 3,0 | T | Z | | P | K | W |
| 3 | INZ0285s | Diploma Seminar | | | | | 2 | K1INF_K01, K1INF_K02, K1INF_K03, K1INF_K04, K1INF_K05, **K1INF_K07** K1INF_U11, K1INF_U12, K1INF_U13 | 30 | 60 | 2 | 1,2 | T | Z | | | K | W |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | INZ0286D | Diploma Thesis | | | | 6 | | K1INF_K01, K1INF_K02, K1INF_K03, K1INF_K04, K1INF_K05, K1INF_U11, K1INF_U12, K1INF_U13 | 90 | 360 | 12 | 7,2 | T | Z | | P | K | W |
| 5 | INZ0295Q | Practical Training | | | | | | | | 150 | 5 | | | | | | | |
| | | Total | 0 | 0 | 0 | 12 | 2 | | 210 | 780 | 26 | 12,6 | | | | | | |

**Altogether for main-field-of-study modules:**

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| 12 | 2 | 9 | 14 | 3 | 600 | 1770 | 59 | 32,4 |

## 4.2.4 List of specialization modules

### 4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min. .... ECTS points):*

| No.. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol **GK**) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form[2] of course/group of courses | Way[3] of crediting | Course/group of courses | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes[1] | | | university-wide[4] | practical[5] | kind[6] | type[7] |
| | | | | | | | | | | | | | | | | | | |
| | | Total | | | | | | | | | | | | | | | | |

### 4.2.4.2 ……*(e.g. diploma profile)* module *(min. .... ECTS points):*

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

**Altogether for specialization modules:**

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes[1] |
|---|---|---|---|---|---|---|---|---|
| lec | cl | lab | pr | sem | | | | |
| | | | | | | | | |

## 4.3 Training module (Faculty Council resolution on principles of crediting training – attachment no. …)

| **Name of training** | | | |
|---|---|---|---|
| **Number of ECTS points** | **Number of ECTS points for BK classes[1]** | **Training crediting mode** | **Code** |
| **5** | **0** | **Z** | INZ0295Q |

| **Training duration** | **Training objective** |
|---|---|
| **4 weeks** | *Familiarization with the professional IT solutions, their designing, programming, deploying and administration of IT companies. Then formulation and implementation of simple engineering tasks to check the previously acquired skills and competences, especially including the teamwork.* |

## 4.4 Diploma dissertation module

| **Type of diploma dissertation** | Licencjat / inżynier / magister / magister inżynier | |
|---|---|---|
| **Number of diploma dissertation semesters** | **Number of ECTS points** | **Code** |
| **1** | **12** | INZ0286p |
| **Character of diploma dissertation** | | |
| **Project, computer program** | | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | |
|---|---|
| **Number of BK[1] ECTS points** | **7,2** |

## 5. Ways of verifying assumed educational effects

| **Type of classes** | **Ways of verifying assumed educational effects** |
|---|---|
| lecture | e.g. examination, progress/final test |
| class | e.g. progress/final test |
| laboratory | e.g. pretest, report from laboratory |
| project | e.g. project defence |
| seminar | e.g. participation in discussion, topic presentation, essay |
| training | e.g. report from training |
| diploma dissertation | prepared diploma dissertation |

## 6. Total number of ECTS points, which student has to obtain from classes requiring direct academic teacher-student contact (enter total of ECTS points for courses/groups of courses denoted with code BK[1])

…123,2…. ECTS

## 7. Total number of ECTS points, which student has to obtain from basic sciences classes

| | | |
|---|---|---|
| Number of ECTS points for obligatory subjects ……. | 27 | |
| Number of ECTS points for optional subjects …. | 0 | |
| Total number of ECTS points | 27 | |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

**8. Total number of ECTS points, which student has to obtain from practical classes, including laboratory classes** (enter total number of ECTS points for courses/group of courses denoted with code P)

| | | |
|---|---|---|
| Number of ECTS points for obligatory subjects ……. | 41 | |
| Number of ECTS points for optional subjects …. | 36 | |
| Total number of ECTS points | 77 | |

**9. Minimum number of ECTS points, which student has to obtain doing education modules offered as part of university-wide classes or other main field of study** (enter number of ECTS points for courses/groups of courses denoted with code OG)

…25…. ECTS points

**10. Total number of ECTS points, which student may obtain doing optional modules (min. 30% of total number of ECTS points)**

**…69….** ECTS points

**11. Range of diploma dissertation**

1. Basic operations on sets, functions and relations. Sentential calculus. Calculus of Predicates.
2. Graphs (basic concepts, spanning tree, Euler and Hamilton cycles, consistency).
3. The concept of the algorithm.
4. Fundamentals of algorithm analysis. Computational complexity.
5. An examples of algorithms. Sorting algorithms, selection, search.
6. Elements of a programming language: variables, data types, expressions, statements and control structures.
7. Object-oriented programming (classes and objects). Inheritance and polymorphism.
8. Basic elements of digital structures.
9. Von Neumann computer architecture.
10. Microcomputers - organization and architecture.
11. Parallel computers architecture.

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

12. Embedded systems architecture. Designing of embedded systems. MHP design environment.
13. Information systems models (general- and specific-purposes systems).
14. Local and wide area networks – topological structures.
15. Reference models of computer networks (Open System Interconnection/International Standard Organization and Transport Control Protocol/Internet Protocol models).
16. Protocols of computer networks.
17. Data link layer protocols. Ethernet. TCP/IP protocols stack.
18. Client-server model. Http protocol.
19. Transmission channels and their organization for information transmission purposes.
20. Websites and web application programming language.
21. Distributed systems.
22. Communication in distributed systems.
23. Algorithms for data exchange. Mechanisms of the implementation of distributed services.
24. Inter process communication (IPC).
25. Software development methodology.
26. Structural and object-oriented software design.
27. Models of software life cycle.
28. UML as a language of design specifications.
29. Design patterns.
30. Project Management - the structure of work, planning, scheduling, monitoring and quality.
31. Artificial intelligence - basic concepts, area of studies, areas of application.
32. Database models. A relational database. Normalization. Transactions.
33. Basics of SQL.
34. Basics of database and data warehouses design.
35. Mechanisms of knowledge processing in expert systems
36. Operating system.
37. The layered structure of the operating system.The concept of the system kernel.
38. Computer and Network Security.
39. Security models. Information flow model. Security of IP and IP v6 protocol.

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

40. Structure and properties of control systems. Typical control algorithms. Construction and structure of a typical computer control systems.
41. Static object identification algorithms. Analytical and numerical methods of optimization.

## 12. Requirements concerning deadlines for crediting courses/groups of courses for all courses in particular modules

| *No.* | *Course code* | *Name of course* | *Crediting by deadline of... (number of semester)* |
|---|---|---|---|
| 1 | FZP1052C | General Physics | 3 |
| 2 | FZP1052W | General Physics | 3 |
| 3 | MAP1070C | Elementary Linear Algebra | 3 |
| 4 | MAP1070W | Elementary Linear Algebra | 3 |
| 5 | MAP1043C | Mathematical Analysis I | 3 |
| 6 | MAP1043W | Mathematical Analysis I | 3 |
| 7 | INZ0250Wl | Introduction to Programming (GK) | 3 |
| 8 | INZ0251Wc | Introduction to Computer Systems (GK) | 3 |
| 9 | FZP2079L | General Physics | 4 |
| 10 | MAP2005C | Mathematical Analysis II | 4 |
| 11 | MAP2005W | Mathematical Analysis II | 4 |
| 12 | INZ0252Wc | Electronics and Metrology – basic principles (GK) | 4 |
| 13 | INZ0253Wl | Computer Architecture and Organization (GK) | 4 |
| 14 | INZ0254Wcl | Data Structures and Algorithms (GK) | 4 |
| 15 | INZ0255C | Theory of Information and Signals | 5 |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | |
|---|---|---|---|
| 16 | INZ0255W | Theory of Information and Signals | 5 |
| 17 | INZ0256L | Electronics and Metrology – basic principles | 5 |
| 18 | INZ0257C | Theory of Probabilistic and Statistics | 5 |
| 19 | INZ0257W | Theory of Probabilistic and Statistics | 5 |
| 20 | INZ0258C | Logics and Discrete Mathematics | 5 |
| 21 | INZ0258W | Logics and Discrete Mathematics | 5 |
| 22 | INZ0259Wcl | Databases **(GK)** | 5 |
| 23 | INZ00260Wl | Object-Oriented Programming **(GK)** | 5 |
| 24 | INZ0297W | Systems analysis and decision support methods in Computer Science | 6 |
| 25 | INZ0297C | Systems analysis and decision support methods in computer Science | 6 |
| 26 | INZ0297L | Systems analysis and decision support methods in Computer Science | 6 |
| 27 | INZ0262W | Computer Networks and Communications | 6 |
| 28 | INZ0262l | Computer Networks and Communications | 6 |
| 29 | INZ0263Wcl | Introduction to Software Engineering **(GK)** | 6 |
| 30 | INZ0264Wl | Operating Systems **(GK)** | 6 |
| 31 | INZ0265Wl | Multimedia Embedded Systems **(GK)** | 6 |
| 32 | ZMZ1496W | Introduction to Management Science | 5 |
| 33 | INZ0268Wl | Data Warehouses **(GK)** | 5 |
| 34 | INZ0298W | Computer Control Systems | 5 |
| 35 | INZ0298L | Computer Control Systems | 5 |
| 36 | INZ0298P | Computer Control Systems | 5 |
| 37 | INZ0270Wp | Software System Development **(GK)** | 5 |
| 38 | INZ0277Wl | Introduction to Parallel and Distributed Systems **(GK)** | 6 |

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

| | | | |
|---|---|---|---|
| 39 | INZ0278Wl | Computer Security **(GK)** | 6 |
| 40 | INZ0279Wl | Introduction to Artificial Intelligence **(GK)** | 6 |
| 41 | JZL100400BK | Foreign languages | 6 |
| 42 | WFW000000BK | Sports | 6 |
| 43 | INZ0284Wl | Internet Technologies **(GK)** | 7 |

## 13. Plan of studies (attachment no. 1)

Approved by faculty student government legislative body:

..... .....
Date, name and surname, signature of student representative

..... .....
Date, Dean's signature

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob